Evaluation of tubal patency by transvaginal sonosalpingography

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Objective: To evaluate tubal patency by transvaginal sonosalpingography.

Design: Comparative study of transvaginal sonosalpingography with chromolaparoscopy in subjects with unknown tubal function.

Setting: Outpatient infertility clinic at Zeynep Kamil Maternity Hospital in Istanbul, Turkey.

Patients: Forty-two cases of unknown tubal function with infertility complaints were included.

Interventions: Isotonic saline was injected into the uterine cavity through a catheter.

Main Outcome Measures: Transvaginal sonosalpingography is a safe, easy, and cost-effective procedure for screening tubal status.

Results: The results obtained from transvaginal sonosalpingography and laparoscopy were completely consistent for 29 cases (76.32%) and partially consistent for 8 cases (21.05%). Transvaginal sonosalpingography accurately showed patency in 26 patients and bilateral nonpatency in 3 patients.

Conclusions: Transvaginal sonosalpingography, with its accuracy and safety, is a promising screening and diagnostic technique in the evaluation of tubal patency on ambulatory basis.


Key Words: Transvaginal sonosalpingography, tubal patency, hysterosalpingography

Although it is known that fallopian tubes play an important role in sperm and ovum development and that ciliar and muscular activities are important elements in ovum transport, diagnostic evaluation is limited to either tubal patency or nonpatency. Two nonsurgical methods are available for this purpose: tubal insufflation with carbon dioxide gas (Rubin test) and hysterosalpingography (HSG). Rubin test is highly subjective, whereas HSG exposes the patient to a contrast medium. In evaluation of tubal patency, HSG and laparoscopy give approximately similar results. Laparoscopy, however, is an operational and invasive technique. In the examination of the female genital tract, ultrasonography, being nonionizing, is an alternative to HSG and also an alternative to laparoscopy by being a noninvasive imaging technique.

There are no substantial studies in the literature on the evaluation of the tubal patency by sonographic methods. Richman et al. and Randolph et al. were the first researchers in this field, and they investigated tubal patency by transabdominal sonographic methods. When they had observed the collection of instilled fluid in cul-de-sac, they subtly concluded the patency of one and/or both fallopian tubes. Deichert et al. developed a new transvaginal ultrasonographic technique in 1989. By transcervical injection of an echogenic and ultrasonic contrast fluid SHU 454 (Echovist; Schering, Berlin, Germany), they have visualized the patent tube directly and hence have shown tubal patency.
We have developed an easier technique in which the patient does not require hospitalization. By intrauterine injection of isotonic saline, we have intended to evaluate tubal patency directly and called this method transvaginal sonosalpingography.

MATERIALS AND METHODS

Forty-four cases of unknown tubal function were included and evaluated in this study group in our infertility clinic between August 1, 1990 and December 1, 1990. Five of these patients did not return for laparoscopy, and because one of the patients had severe adhesions, tubal function could not be evaluated clearly by laparoscopy. Therefore, these six patients were excluded from the study and were not further evaluated. After an explanation of the procedure, 50 mg of Pethidine hydrochloric acid (Aldon-Gerol; Gerot Pharmazeutike, Vienna, Austria) was administered intramuscularly as premedication, and 30 minutes later determination of tubal patency was initiated without anesthesia by using isotonic saline during the proliferative phase.

Transvaginal sonography was carried out through the use of Hitachi EUB 305 (Hitachi Medical Cooperation 1-1-14, Uchi Kanda Chiyoda, KU, Tokyo, Japan) with a 5-mHz vaginal probe. Transvaginal sonosalpingography was performed in dorsal lithotomy position after basic pelvic sonography. After placement of a vaginal speculum, the vagina was disinfected by Betaisodane antiseptic solution (Mundipharma, Basel, Switzerland). Then a semirigid Foley catheter (Rusch no. 8, 3 mL, Kernen, Germany) was directed into the uterine cavity, and the balloon was inflated supracervically with 2 mL of isotonic saline. With the exception of two cases, cervix uteri was not held by tenaculum, and only one case required cervical dilatation.

The semirigid catheter guide in Foley and the speculum were both removed before sterile isotonic saline was injected intermittently (volume between 10 and 40 mL) through the Foley catheter. During the observation of adnexial regions on transverse section mode, the flow in the tubes was followed and photographed. In transvaginal sonosalpingography, observation of either forward flow of the saline for at least 5 seconds between pars intramuralis and isthmus tubae without interruption and hydrosalpinx formation and/or the fimbrial turbulence to cul-de-sac were considered as the presence of tubal patency (Figs. 1, top and middle).

Figure 1  (top), The appearance of catheter's balloon in uterine cavity (indicated by b in figure) and left tube from pars intramuralis to isthmus tubae by transvaginal sonosalpingography indicated by arrowhead. (middle), The flow of saline through left tube from pars intramuralis to ampulla and fimbrial turbulence by transvaginal sonosalpingography indicated by arrowheads. (bottom), Expansion of cavum uteri in bilateral tubal occlusion indicated by arrowheads.
Table 1  Comparison of Transvaginal Sonosalpingographic and Laparoscopic Findings

<table>
<thead>
<tr>
<th>Transvaginal sonosalpingography findings</th>
<th>Both tubes patent</th>
<th>Left tube patent, right nonpatent</th>
<th>Right tube patent, left nonpatent</th>
<th>Both tubes nonpatent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both tubes patent</td>
<td>16</td>
<td>2</td>
<td>2</td>
<td>—</td>
<td>20</td>
</tr>
<tr>
<td>Left tube patent, right nonpatent</td>
<td>1</td>
<td>4</td>
<td>—</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Right tube patent, left nonpatent</td>
<td>1</td>
<td>6</td>
<td>—</td>
<td>—</td>
<td>7</td>
</tr>
<tr>
<td>Both tubes nonpatent</td>
<td>1</td>
<td>—</td>
<td>—</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Fluid in cul-de-sac</td>
<td>2</td>
<td>—</td>
<td>—</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>6</td>
<td>8</td>
<td>3</td>
<td>38</td>
</tr>
</tbody>
</table>

* Complete accordance results with transvaginal sonosalpingography and laparoscopy.

b Partial accordance results with transvaginal sonosalpingography and laparoscopy.

d Passage through the tubes could not be evaluated.

d Fluid in cul-de-sac.

Intratubal flow was followed for at least 5 seconds in both tubes. Then the cul-de-sac was imaged, and the collection of fluid therein was accepted as the evidence of the passage through at least one tube. After this procedure, the patient was allowed to rest for 10 minutes and requested to return during the luteal phase of the same cycle for laparoscopy.

The study group was later re-admitted to the hospital for routine preoperative care and hospitalization. Chromolaparoscopy was performed on the following day. In laparoscopy, sterile 1% methylene blue was used for chromopertubation.

When transvaginal sonosalpingography data are compared with laparoscopy, complete consistence means that the passage through bilateral fallopian tubes are identical by both methods. Partial consistence indicates identical results only by either left or right tube. When the site of passage was not visualized exactly, fluid collected in the cul-de-sac was regarded as the evidence of either a right or-and left patent tube.

RESULTS

The mean age of cases was 24.17 ± 2.83 years. The youngest was 20 and the oldest 35 years of age.

The results obtained from transvaginal sonosalpingography and laparoscopy were completely consistent for 29 cases (76.32%), and partially consistent for 8 cases (21.05%). Only 1 case (2.63%) showed an inconsistent result. (Table 1)

Transvaginal sonosalpingography indicates tubal patency or nonpatency in 37 of 38 cases. Although sensitivity and specificity were calculated, the statistical difference is not significant because of the inadequate number of abnormal tubes. Only 1 case showed an advanced dilatation of the uterine cavity, and hence no passage was observed from the tubes (Fig. 1, bottom). In this case, basic ultrasonographic examination and laparoscopy confirmed the presence of fluid in the cul-de-sac, and moreover, chromopertubation showed bilateral tubal patency. Transvaginal sonosalpingography accurately showed patency in 26 patients and bilateral nonpatency in 3 patients.

In only 2 cases in which no patency was seen in both tubes under sonographic evaluation, indirect diagnosis of tubal patency was done by observing free fluid in the cul-de-sac. A total of 35 cases that were examined by laparoscopy, showed patency, either from the right and/or left tube. Thirty-four cases showed the collection of fluid in the cul-de-sac by transvaginal sonosalpingography.

The flow from the fimbrial ends and fimbrial turbulence were observed in only 11 cases by transvaginal sonosalpingography, which was compatible with laparoscopy. Bilateral fimbrial turbulence was observed in only 3 cases. (Fig. 1, middle) (Table 2)

Table 2  Fimbrial Turbulence by Transvaginal Sonosalpingography and its Relation to Laparoscopic Findings

<table>
<thead>
<tr>
<th>Fimbrial turbulence by transvaginal sonosalpingography</th>
<th>No.</th>
<th>Laparoscopic findings*</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilaterally</td>
<td>3</td>
<td>Both tubes open</td>
<td>3</td>
</tr>
<tr>
<td>At right only</td>
<td>4</td>
<td>Right tube open</td>
<td>4</td>
</tr>
<tr>
<td>At left only</td>
<td>4</td>
<td>Left tube open</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td></td>
<td>11</td>
</tr>
</tbody>
</table>

* Fimbrial turbulence is not observed and included.
In the course of the transvaginal sonosalpingography, no serious side effects were observed during and after the transvaginal sonosalpingography procedure. While performing transvaginal sonosalpingography, 18 patients had complaints of tolerable groin pain. Only 3 patients expressed groin pain that continued for half an hour after transvaginal sonosalpingography, but no medication was required for these cases.

The shortest time period of transvaginal sonosalpingography was 3.5 minutes, and the longest period was 12 minutes. The mean value was 7.35 ± 1.27 minutes. The volume of sterile isotonic saline injected was from 10 to 40 mL, the mean value of this solution was 27.48 ± 5.79 mL.

DISCUSSION

The transabdominal sonographic evaluation of tubal patency was first reported by Richman et al. In their studies, with the aid of a special intrauterine catheter, Harris uterine injector (Unimar, Canoga Park, CA), researchers had made the cul-de-sac visible by injecting an ultrasonic contrast medium Hyskon (dextron in dextrose; Pharmacia Laboratories, Piscataway NJ). To visualize the cul-de-sac, they had injected at least 20 mL of Hyskon. The accumulation of fluid in the cul-de-sac has been accepted as the indicator of tubal patency. In this study, consisting of 35 cases, ultrasonography showed bilateral tubal occlusion with 100% sensitivity and tubal patency with 96% specificity indirectly.

In 1986, Randolph et al. inserted a Rubin cannule in the cervix of 61 patients, injected 200 mL isotonic saline, and observed the cul-de-sac by transabdominal sonography. They accepted the presence of retrouterine fluid as the criteria for the patency of one or both tubes. The procedure was performed while the patients were under general anesthesia.

Deichert et al. used transvaginal hysterocntrast sonography, pioneering the comparison of the uterine cavity and myometrial findings. First, 30 cases with sterility problems, possible tumor, or bleeding problems were studied under general anesthesia. A Rubin cannule (or a bladder catheter no. 8) was placed intracervically, and, by injecting isotonic saline, the uterine cavity was directly visualized. The tubes were also visualized by isotonic saline and/or contrast medium SHU 454.

The same researchers have continued their studies on transvaginal hystereontrast sonography under general anesthesia. They visualized the tube with the aid of contrast medium and compared tubal patency obtained from transvaginal hystereontrast sonography with laparoscopy or HSG. They found that 72% of cases gave completely consistent results. Only 2% of the cases were inconsistent.

Transvaginal sonosalpingography performed with isotonic saline, without general anesthesia, is physiological, easy to perform, safe, cost-effective, non-invasive, and potentially more convenient when compared with other conventional methods. There is no need for HSG sets, such as Rubin cannule. With the exception of two cases, tenaculum was not used in this study.

Transvaginal sonosalpingography is a short-lasting method. When sterile conditions are provided, there is no infectious morbidity of this technique. Laparoscopies performed after 7 to 10 days have not shown any evidence of infection.

As stated by other researchers, HSG presents a number of potential problems in evaluating the upper genital tract. Iodinated contrast materials could produce an anaphylactic reaction in a sensitized patient. The information is limited to internal Müllerian duct anatomy. Moreover, this technique requires radiologic facilities and associated staff.

Transvaginal sonosalpingography, when compared with HSG: (1) is as accurate in demonstrating the presence of tubal patency; (2) is potentially safer; (3) is potentially more convenient and less expensive; (4) idiosyncrasy to the contrast agent cannot be expected; and (5) the procedure could be performed on an ambulatory basis as a screening procedure. However, the technique does not provide an accurate assessment of intrauterine and tubal anatomy. Hysterosalpingography should be performed for this purpose.

Transvaginal sonosalpingography may also be used to assess tubal status after microsurgery for reanastomosis and is clearly indicated in patients with a history of reactions to iodinated contrast material.

Transvaginal sonosalpingography technique depends on the experience of the ultrasonograph in evaluating the images, which are quite different from the classical findings especially in the assessment of both tubal structures. During the procedure, visualizing the flow in tubes for at least 5 seconds of the observation of fimbrial turbulence are of utmost importance. We believe that these accurate results, coupled with the forementioned benefits, make transvaginal sonosalpingography a promising screen-
ing and diagnostic technique in the evaluation of tubal patency.

REFERENCES